USER-MANUAL
TV12

Tamson Instruments bv

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1 SAFETY AND WARNINGS

Make sure before installing or operating the equipment to read and understand all instructions and safety precautions listed in this manual. If there are any questions concerning the operation of the equipment or about the information given in this manual please contact your local dealer or our sales department first.

Performance of installation, operation, or maintenance other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.

Never operate equipment that is not correctly installed. Unqualified personnel must not operate the equipment. Avoid damage to the equipment, or its accessories, caused by incorrect operation.

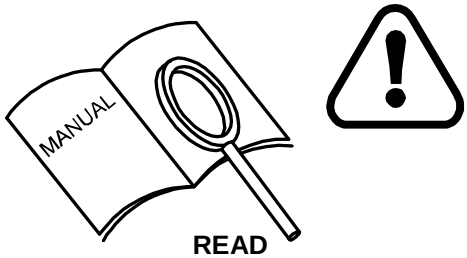
Important:
- When performing service, maintenance or moving the apparatus, always disconnect the apparatus at the main's socket,
- Proper skilled and trained personnel are only allowed to operate this equipment,
- Take notice of warning labels and never remove them,
- Refer service and repairs to qualified technician,
- If a problem persists, call your supplier or Tamson Instruments b.v.

2 WARRANTY

Tamson Instruments b.v. warrants that all their manufactured equipment is free from defects in material and workmanship, preventing the machine from normal operation. Tamson Instruments b.v does not warranty that the equipment is fit for any other use than stated in this manual. The manufacturer can only be held responsible for the security, reliability and performance of the equipment, when operated in accordance with the operating instructions, extensions, adjustments, changes and/or if repair is performed by Tamson Instruments b.v. or authorized persons only. This warranty is limited to one year from the date of invoicing. All equipment and materials are subject to standard production tolerances and variations.

3 PRECAUTIONS AND HAZARDS

Before attempting to operate the bath read all parts of this manual carefully to insure smooth operation and avoid damage to the equipment or its accessories.



READ CAREFULLY

If a malfunction occurs, consult section "Trouble Shooting", page 24 at the end of this manual.
If problem persists, call your supplier or Tamson Instruments bv. Never operate the equipment if not correctly installed. The equipment must be operated only by qualified personnel. Avoid damage to the equipment or its accessories through incorrect operation.

4 INSTALLATION

4.1 Important

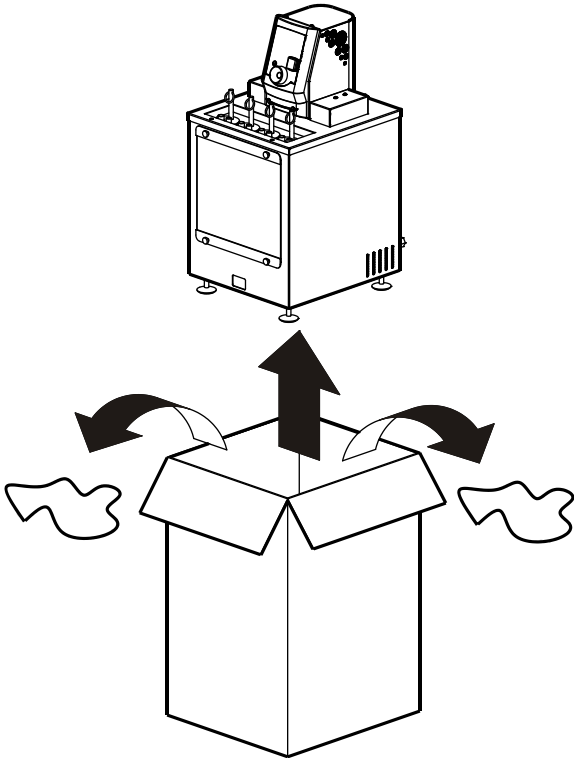
Tamson Instruments bv is not responsible for any consequential damage or harm caused by using this bath. Repairs on the electrical system of the bath may only be carried out by well trained and authorized persons.

4.2 Unpacking

Before leaving the factory Tamson baths are adequately packed to prevent damage during normal transportation. Check the packing for external damage and make a note on the shipping documents if any damage is found. Always retain the cartons and packing material until the bath has been tested and found in good condition. (Transport companies generally will not honor a claim for damage if the respective packing material is not available for examination).

The shipment contains at least the bath as mentioned in the delivery checklist. Further the consignment might contain one or more viscometers, individually packed in small boxes with the calibration certificate included in the box, as well as ASTM thermometers, thermometer holders etc. Please see the packing list for details concerning total contents of consignment.

Before filling the bath remove any remaining packing material from its interior. The interior of the bath can be accessed by taking off the lid on the top of the bath.



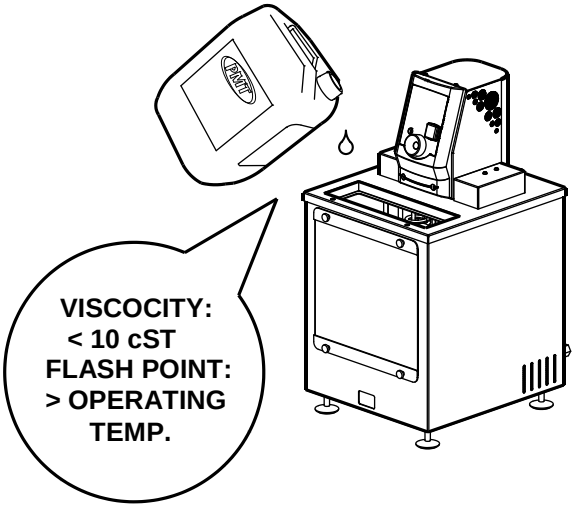
REMOVE ALL PACKAGE MATERIAL

4.3 Bath liquid

The bath must be filled with a liquid suitable for the minimum operating temperature.

It is very important to select a liquid with a viscosity of less than 20 cSt. At working temperature (SP) the viscosity must be below 10 cSt.

When using flamable bath liquid choose a flash point well above the operating temperature.



The use of other liquids is allowed as long as the viscosity of the fluid is low enough at the operating temperature. The viscosity must be below 10 cSt. High viscosity will result in poor stability as well as poor uniformity of the bath.

The fluid flashpoint must be well above the maximum operating temperature. Fluid must not be aggressive when in contact with stainless steel 304, 316, glass or PTFE and silicon sealing.

4.4 Drain bath fluid

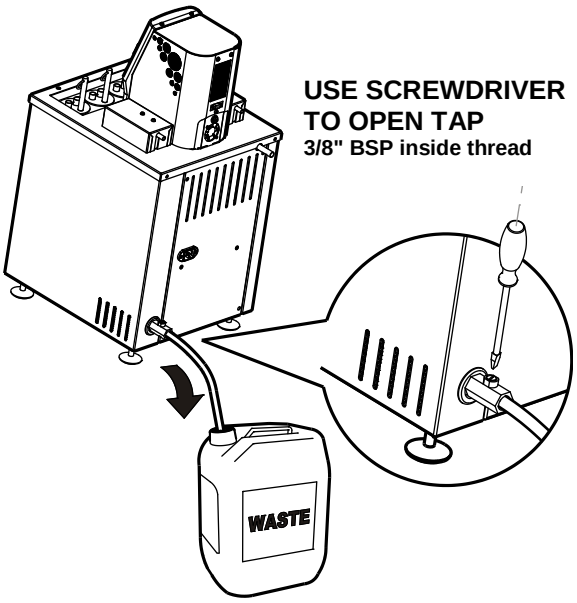
The TV12 can be emptied via the drain tap located at the backside of the apparatus. For safety reasons the tap can only be opened when using a screwdriver. The thread inside the tap is 3/8".

Take necessary precautions against fire hazard when removing flamable bath fluid.

When removing bath fluid do not inhale toxic vapor Always use appropriate ventilation.

Handle old bath fluid as toxic waste.

Cool down bath fluid to ambient before removing.



4.5 Bath fluid level

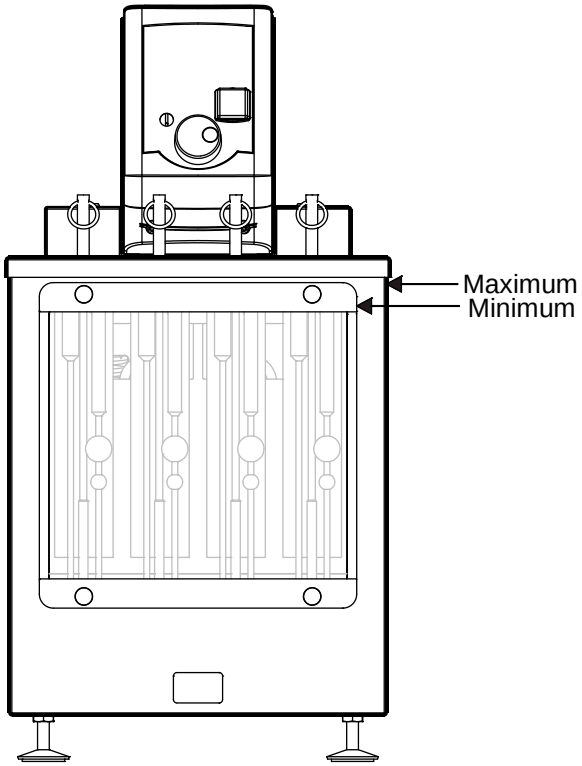
4.5.1 Minimum level

The heating element must be fully covered by the bath fluid. The heating element will be damaged when not fully submerged in the bath fluid.

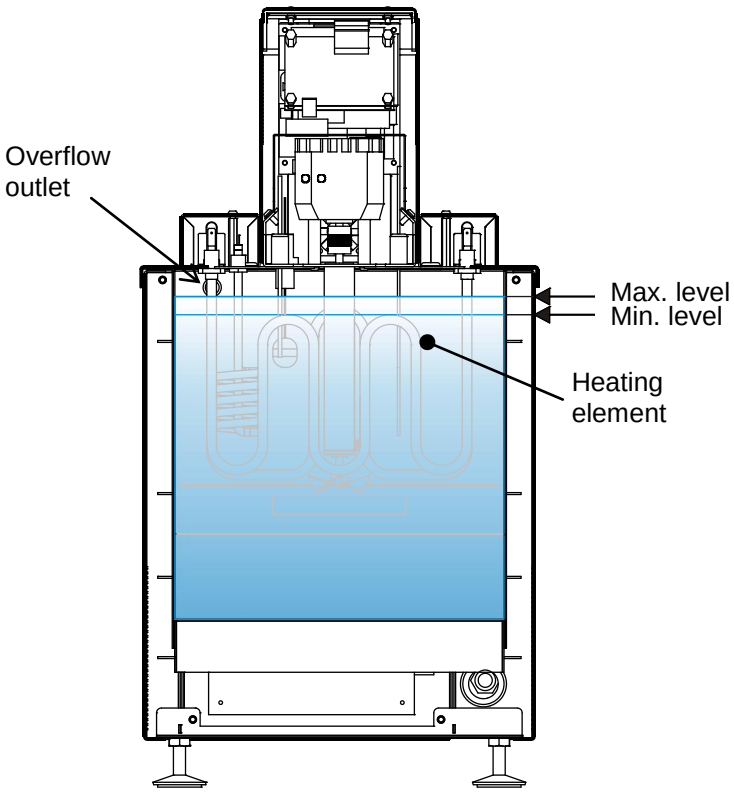
The practical minimum level is indicated below

The level indicator(optional) will start to blink (blue light) when the fluid level is too low.

TV12 front view



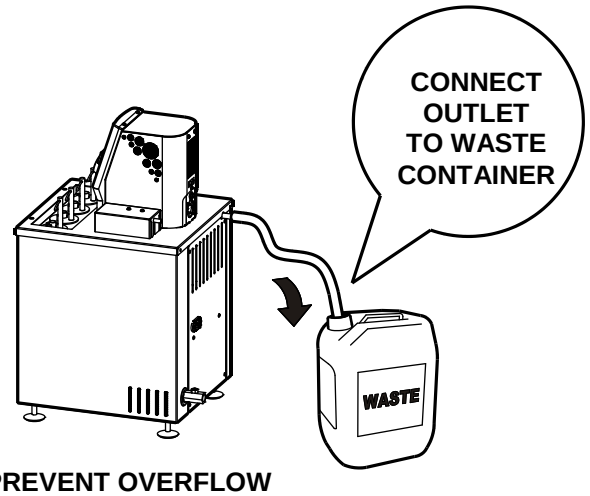
TV12 inside



4.5.2 Maximum level

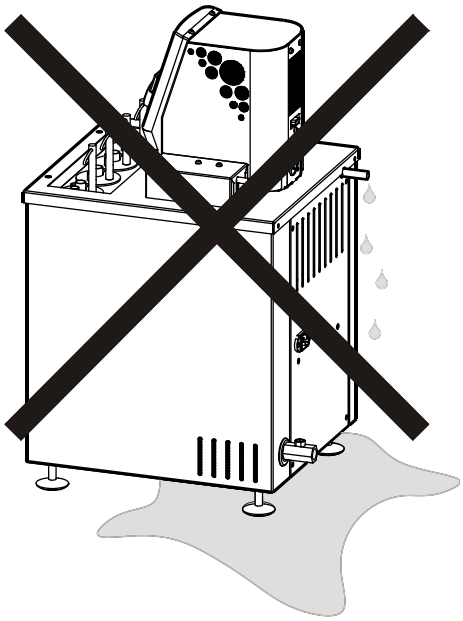
If the fluid level is too high, it will leave the bath via the overflow outlet (10mm outher diameter pipe). Prevent fluid from the overflow outlet entering the backside of the TV12. For this reason the overflow outlet must be connected to a waste container.

When the bath is working at high temperatures, tubing and waste container must be chemical resistant and able to withstand high temperatures (>150°C / 302°F).



PREVENT OVERFLOW

TUBING AND CONTAINER: CHEMICAL RESISTANT WITHSTAND HIGH TEMPERATURE



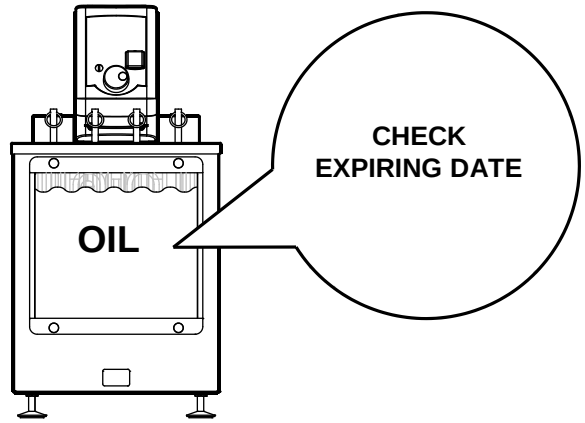
4.6 Bath fluids

We recommend the use of oil with viscosity < 10cSt

Recommended bath fluids		
Range	Ordering code	Description
Ambient to 80°C/176°F	N.A.	Clean tap water NOT DISTILLED
80..150°C / 176..302°F	00T0220 (20 litres)	Tamson mineral oil 150. Transparent, 20cSt @ 80°C/176°F; 3cSt @ 150°C/302°F; F.P. 200°C/392°F.
20..150°C / 68..302°F	08T0001 (gross 20 Kg = 20 ltrs)	Silicon oil 200-10, transparent. 10 cSt @ 25°C/77°F;10 cSt @ 150°C/301°F. F.P. 211°C/411°F. Lifetime >2 years.

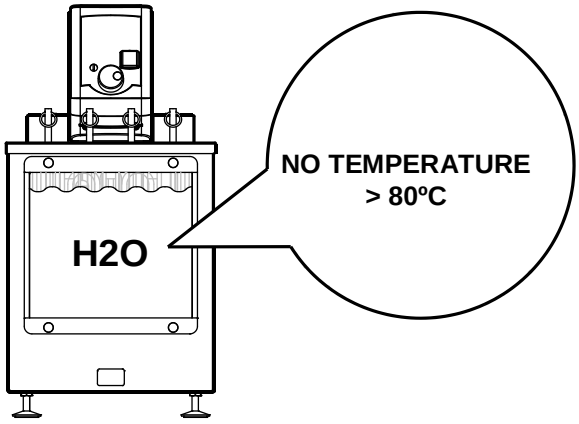
The oil used has a limited lifetime.

The type, brand and operating temperature mainly determines lifetime. Spilling of sample may also reduce lifetime, in some cases can start chemical reactions. Silicon oil has the tendency to form gel, for this reason silicon oil has to be replaced as soon as visible changes are noticed like string forming. Within a few hours silicon oil can transform itself into solid gel, which is very difficult to remove. When not totally cleaned, very small pieces of left over gel will catalyze new oil to form gel!

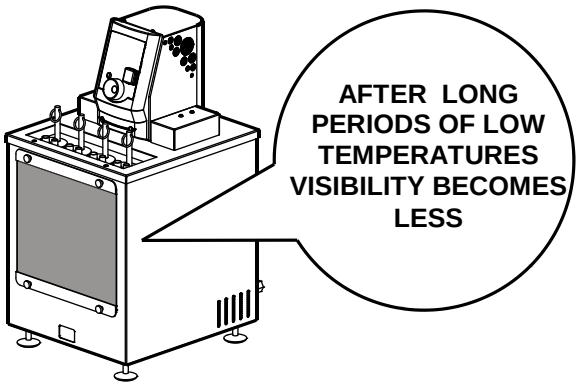


Do not use distilled water. This will cause serious corrosion.

Only use water as a bath fluid below 80°C/176°F. Working for a longer period with water at temperatures above 80°C will damage the stirrer bearings.

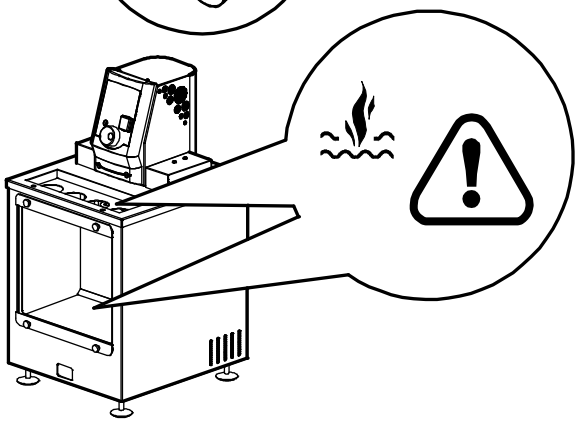


Using the bath for long periods at low temperatures will cause condensation on the glass window resulting in complete invisibility of material placed inside the bath.



When operating at high temperatures the lid (of the bath), top plate and the window section of the bath become very hot. Always use heat protective gloves. Care must be taken when placing or removing material from the bath.

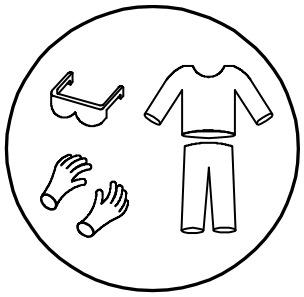
WEAR HEAT PROTECTIVE GLOVES



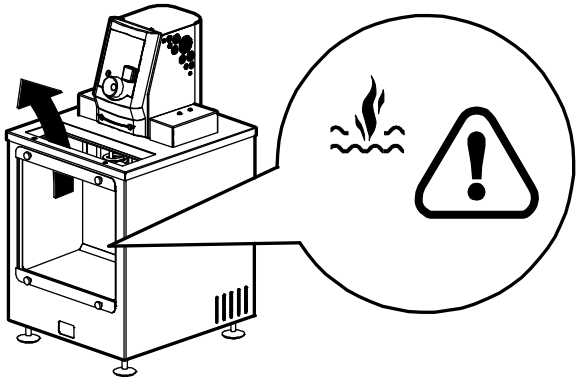
Pay attention when removing hot fluid:

Use heat protective clothing and wear gloves and safety glasses.

WEAR PROTECTIVE GLOVES , CLOTHING AND EYE PROTECTION.

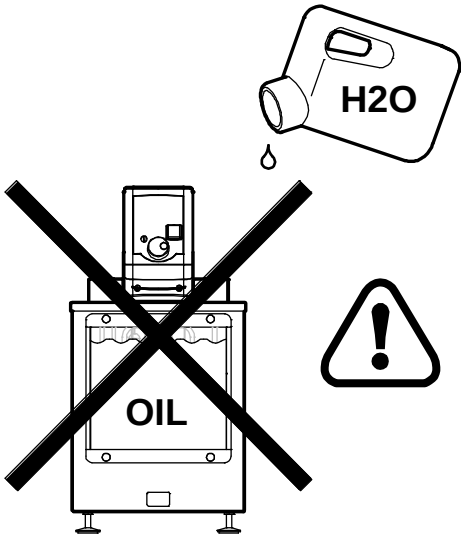


When changing the bath fluid from water to oil for operating at temperatures above 80°C, completely remove all the water from the bath. Small drops of water may result in hazardous situations while reheating the bath with oil.

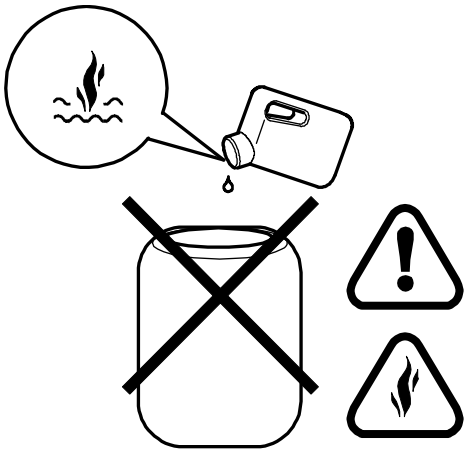


Water and oil must at all times be kept separate within the bath. Never mix oil and water in or around the bath.

Do not spill water in hot oil.

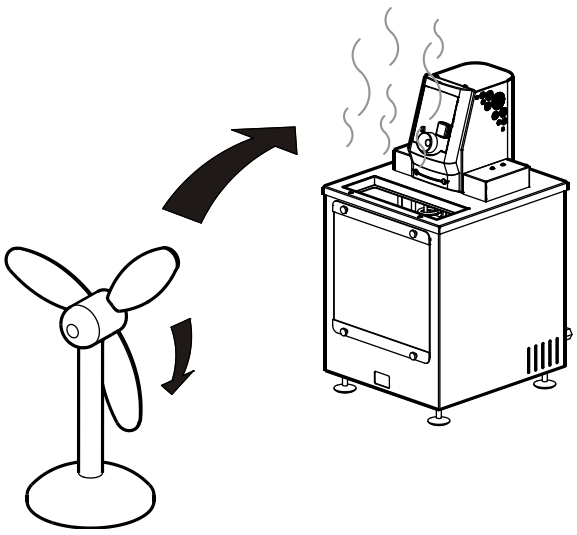


Never empty hot oil into a plastic container.



Heated bath fluid can cause toxic fumes. Take preacutions and read material safety sheet if applicable.

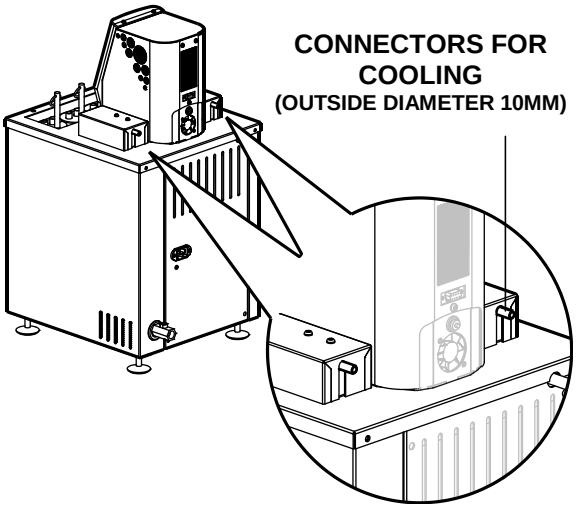
Remove fumes from hot oil or bath medium. Use fume cabinet or proper air ventilation



Cooling

The bath is provided with an integral cooling coil. Because of the friction-heat generated by the stirrer mechanism the bath will heat-up slowly. The lowest operating temperature at which the bath can be controlled depends on the fluid used and the ambient temperature. When operating at temperatures around or below ambient it is necessary to pass a small amount of tap water through the cooling coil. Generally the temperature of the cooling coil water should be 5 degrees (or more) below the desired operating temperature of the bath. To operate around ambient temperature a flow of 1 to 2l/min. is sufficient.

Instead of using tap water a Tamson cooling circulator can be connected to the TV12 to provide cooling. The TLC10-3 is our smallest circulator and well suited for this purpose.



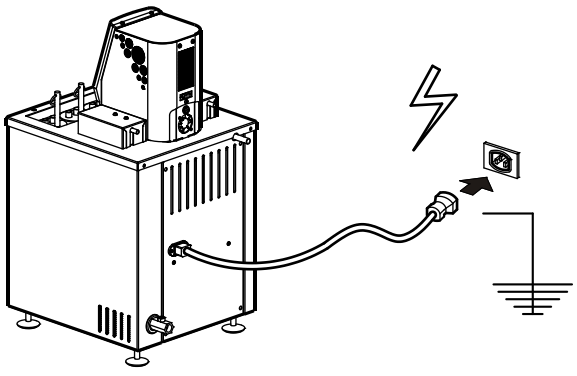
CONNECTORS FOR COOLING
(OUTSIDE DIAMETER 10MM)

TLC10-3
COOLING CIRCULATOR

4.7 Connecting

Before plugging TV12 into the mains socket, make sure the voltage of the bath corresponds to the local voltage.

Use a mains supply that is well earthed, clean of interference and suitable for the acquired electrical load of the bath.



CHECK VOLTAGE
USE WELL EARTHED MAINS

5 INTRODUCTION

The TAMSON model TV12 baths is designed to perform as ultra stable visability bath. The intende use is kinematic viscosity measurement and sensor calibration.

5.1 General

The heat input is controlled by a microprocessor system. A special optimized electronic temperature measurement circuit ensures reproducibility of operation conditions. The baths have an integrated cooling coil as standard, for rapidly reducing bath temperature alternatively for working at or slightly below ambient temperature.

5.2 Construction

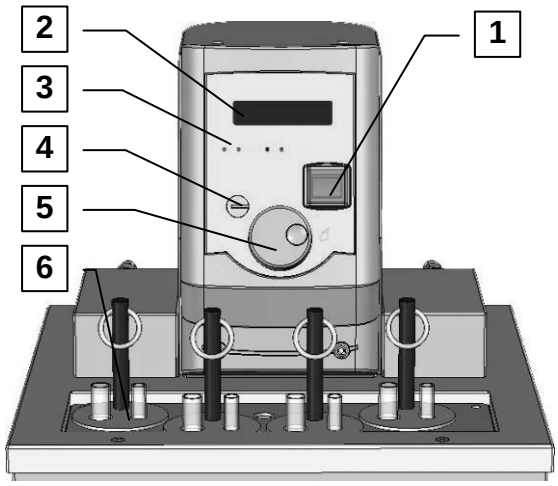
The TAMSON baths are constructed entirely from corrosion-resistant materials – stainless steel and PTFE – entirely. The central microprocessor within the control module manages and controls the functions for temperature measuring regulation, program storage, safety control and error coding.

5.3 Stirrer

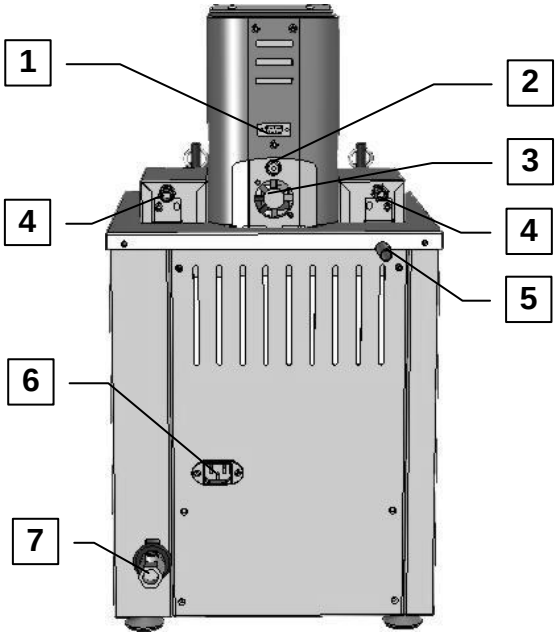
A circulation stirrer is built-in for uniform temperature distribution within the bath.

5.4 Temperature control and setting

The bath temperature is regulated using a Pt-100 temperature probe Class A connected to a microprocessor module. The advanced electronic control system continually computes the energy input required for optimal temperature accuracy and stability. The controller will activate the heaters partially or in full, taking into account the difference between actual bath temperature and set point taking into account the type of bath fluid used and working conditions. This process does not interfere electrically with other equipment since all heating elements are switched in zero-cross mode. Through the application of an especially developed inlet circuit for the temperature probe, the sensitivity to external interference has been reduced to a minimum. The required temperature is set by means of membrane switches on the front panel. An absolute temperature offset is provided with a resolution of 0.1°C. This fine-tuning can be carried out at any time during operation of the bath.



1: On/off switch
2: Display
3: Indicator lights
4: Overtemperature cut-out
5: Encoder switch
6: Viscometer holders



1: RS232 connector (Sub D - female)
2: Motor fuse
3: Fan
4: Cooling coil (10mm outher diameter)
5: Overflow outlet (10mm outher diameter)
6: Mains connector (IEC60320)
(use well protected earth!)
7: Bath drain (3/8" inner thread)

5.5 Safety systems

In case of electronic failure the possibility exists that the heater element is continuously switched on. This will cause extreme temperature raise. To prevent high temperatures the bath is fitted with a mechanical over-temperature protection thermostat. This thermostat will switch-off the bath at a preset temperature in the range from 50 to 270°C.

We advise to adjust the mechanical over temperature to approximately + 25°C above the bath set point.

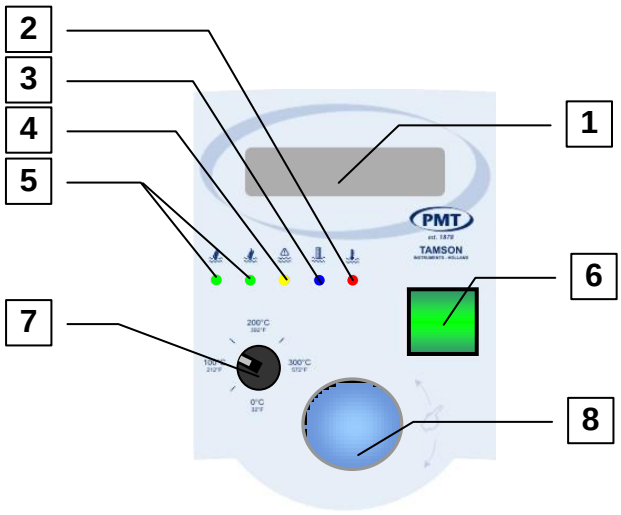
This safety construction prevents for example oil to be heated above flaming-point which will cause fire or prevent evaporation of bath fluid due to high temperatures.

The thermostat will automatically reset when the bath temperature drops approximately 10°C below the pre-set temperature. To continue normal operation the bath has to be switched off and on again.

5.6 Adjusting the mechanical over-temperature protection thermostat

Turn the thermostat clockwise (2, drawing 1) to its maximum. Be aware that the safety thermostat is now only functioning at 270 °C. Heat the bath to the appropriate set point. Gently turn the thermostat anti-clockwise, until the over-temperature protection is activated, and system switches off, Turn the thermostat approximately 30°...40° higher (turn clockwise). Switch the bath off and on again. The bath is ready to operate safely.

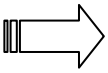
5.7 Front Panel



1 LC Display
2 Overtemperature indicator (Red)
3 Level indicator, optional (Blue)
4 Error (Yellow)
5 Heater indicators (Green)
6 Mains switch
7 Safety thermostat
8 Turn-push button

Use well grounded mains. Before plugging the TV12 into the mains socket, make sure the voltage of the bath corresponds to the local voltage.

The front panel layout shows the turn-push button:

Next / increase:	Turn right	
Previous / decrease:	Turn left	
Select:	Press	

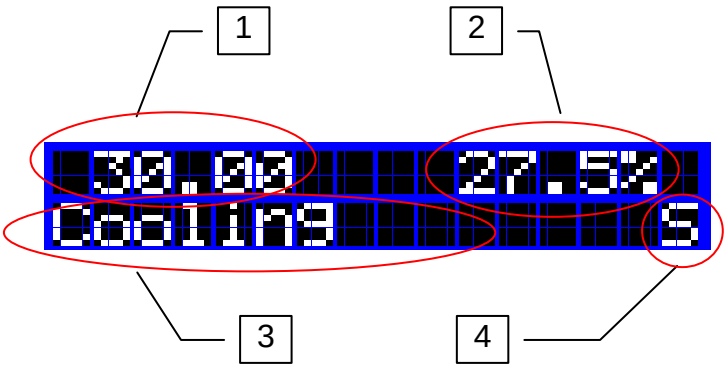
5.8 Overview menu items

- Set point
- Offset (press: <-5.00 .. +5.00°C resolution 0.01°C)
- Max Power (press: low 25, med, hi, max)
- Boost heater (press on / off)
- Time const (press: fast, medium slow, precise)
- Stirrer
- Low alarm
- High alarm
- PID parameter :
  PID set 1,
  PID set 2,
  PID set 3,
  PID set 4.
  Each PID set offers settings for
  - Proportional band value
  (Pb=1/P where P is proportional value)
  - Integral value
  - Differential value
- Backlight
- Temp units
- Baudrate
- SP Offset
- Restart

5.9 Safety thermostat

When the bath temperature becomes higher than the set point temperature of the safety thermostat (Indicated as 7, see page 14), the heating electronics and controller are switched-off. The red LED on the display will light. When the temperature of the bath has been lowered with approximately 20°K, the thermostat re-sets itself automatically, however to continue normal operation the bath has to be switched off and on again.

5.10 Display



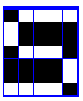
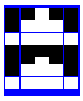
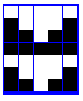
1 Temperature readout
2 Applied percentage of power
3 Operating mode
4 Indicator, alarm high, alarm low, control stable

Ad 1: When the controller starts or is restarted, the displayed value increases to a stable readout appears after a few seconds.
Ad 2: The controller calculates every second the amount of power which should be applied for stable control. The value is displayed with a resolution of 0.1% and ranges from 0% to 99.9%.

Ad 3:

Boost	Bath is heating to set point using boost heater
Heating	Bath is heating to set point, boostheater is off
Cooling	Bath is cooling down to set point
Tuning Ratio	Bath is tuning for power needed at set point, first step
Tuning SA	Bath is tuning, second step
PID SP=25.00	Bath is controlling, set point is 25.00°C (example)

Ad 4:

- Bath control is stable 
- Alarm high, press button to reset 
- Alarm low, press button to reset 

6 OPERATING THE SYSTEM

When the bath is ready for use it can be switched on by pressing the mains switch.

The electronics are suited for both 50 and 60 Hz. Check whether the voltage of the system conforms to the mains voltage

6.1 QUICK START

To start operating the bath in a quick way do the following:

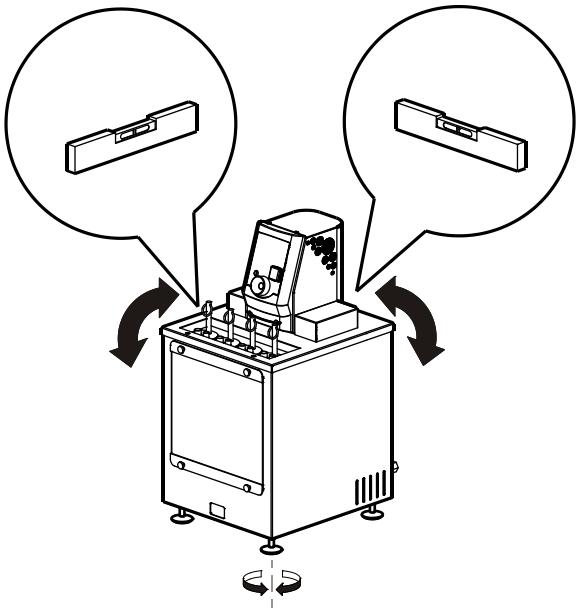
Fill the bath with fluid as indicated in "Bath fluid level", page 6,
Place the power plug, connect to mains socket,
Switch the bath on using the mains switch,
Select appropriate set point,

PID settings
All measuring results have been acquired using following PID settings:
Pb := 25
I := 16
D := 0

Under different settings its possible to achieve even better values by trimming the PID settings.

Place the bath spirit level. The 4 supporting feet can be turned in and outwards for exact adjustment.

SPIRIT LEVEL



7 Menu items

Use the turn-push button to select a menu item and select the item by pressing the button. After pressing a sign appears next to the value indicating the value can now be changed. Pressing the button again activates the value immediately. When the value is altered but the button is not pressed the value will be accepted and stored after 5 seconds automatically. The menu returns back to normal operating mode.

7.1.1 Menu item "Set point"

Select the set point temperature. Resolution is 0.01°C +/- the system accuracy.

7.1.2 Menu item "Offset"

The temperature displayed can be increased or decreased with an offset ranging from +5.00 down to -5.00 °C in steps of 0.01°C. This way the temperature

reading on the display can be synchronised with an independent separate thermometer.

7.1.3 Menu item "Max Power"

(press: low 25, med, hi, max)
Limits the applied power by a maximum value:

Low	Maximum of 25% applied
Medium	Maximum of 50% applied
High	Maximum of 75% applied
Maximum	100% power is applied

7.1.4 Menu item "Boost heater"

A secondary heater is used to quickly heat up the bath. This menu item enables or disables the heater.
Standard value: On

7.1.5 Menu item "Time const"

Used to select time to tune. The option precise has to be used to reach maximum temperature accuracy. Options are:

- Fast	60 seconds
- Medium	120 seconds
- Slow	180 seconds
- Precise	240 seconds
Standard value:	Precise

7.1.6 Menu item "Stirrer"

Optional: Stirrer 0 .. 100% (step 6%). Inactive

7.1.7 Menu item "Low alarm"

Optional: min SP to max SP. resolution 0.1°C. No hardware connected, display function only.

7.1.8 Menu item "High alarm"

Optional: min SP to max SP. resolution 0.1°C. No hardware connected, display function only.

7.1.9 Menu item "PID parameter"

PID set 1	-	First set of parameters
PID set 2	-	Second set of parameters
PID set 3	-	Third set of parameters
PID set 4	-	Activated when communication via RS232

Each set offers individual PID settings for:
- Proportional band value
- Integrating value
- Differentiating value

Default settings

Pb*	:=	25
I	:=	16
D	:=	0

*Pb= proportional band. Proportional value P is found to be 100/Pb.

7.1.10 Menu item "Backlight"

On
Off
Standard value: On

7.1.11 Menu item "Temp units"

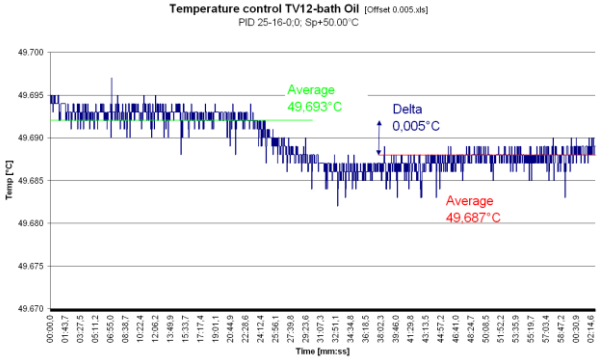
°C
°F
Standard value: °C

7.1.12 Menu item "Baudrate"

300
600
1200
2400
4800
9600
19200
38400
Standard value: 9600

7.1.13 Menu item "Offset 0.005"

This menu item (optional) offers an additional offset of 0.005°C. The value of 0.005°C is added to the selected SP value. The SP can be selected with 0.01°C accuracy.



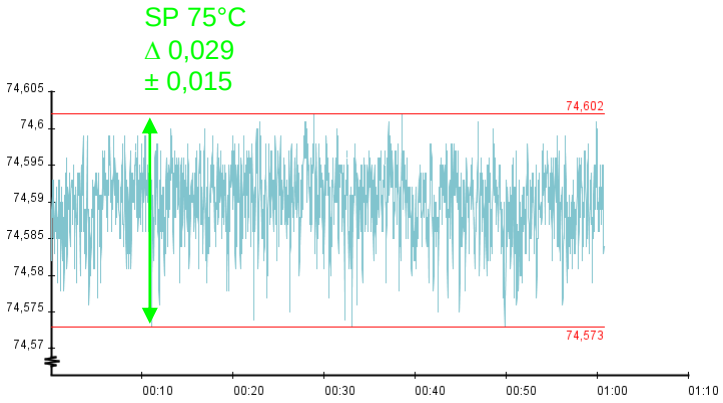
7.1.14 Menu item "Restart"

Restarts system and activates tuning

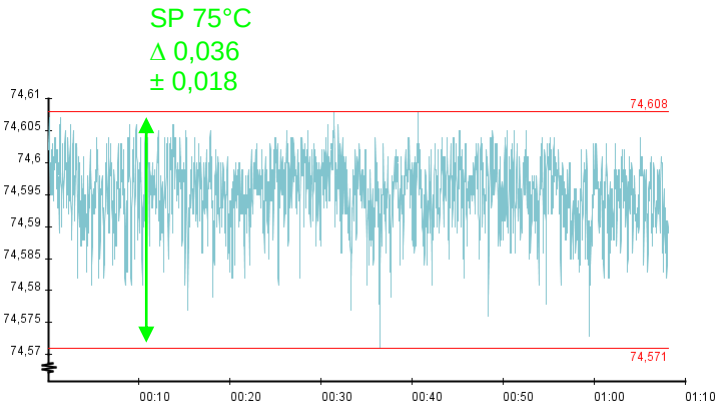
7.2 PID settings

Following shows influence on stability with different PID settings

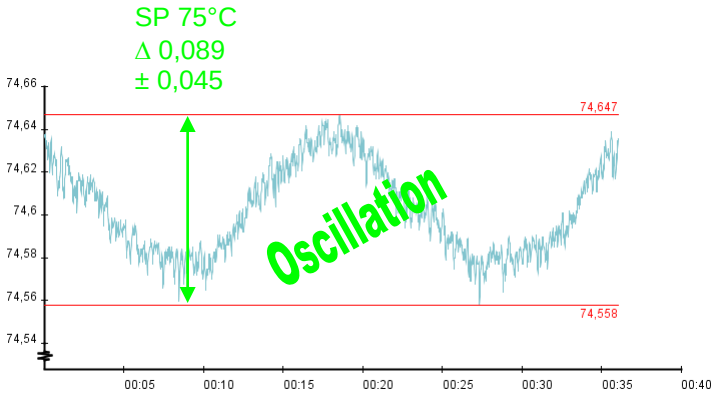
Temperature	:	75°C
Proportional band (Pb)	:	25
Integrator	:	16
Differentiator	:	0
Min/max	:	± 0,015



Temperature	:	75°C
Proportional band (Pb)	:	50
Integrator	:	25
Differentiator	:	0
Min/max	:	± 0,018°C



Temperature	:	75°C
Proportional band (Pb)	:	100
Integrator	:	25
Differentiator	:	0
Min/max	:	± 0,045°C



7.3 Manual tuning

The parameters for the PID control can be changed manually.

The control of the PID parameters allow setting of the I and D values to zero. The bath will then function as a proportional system. The “P” parameter can than be varied to an optimal value by trial and error. A higher P will stabilize the system when I and D are off. The PID parameters can also be determined with the use of the Ziegler Nichols method described below.

The PID paramters can also be determined with the use of the Ziegler Nichols method described below. With the proces at its normal proces value.

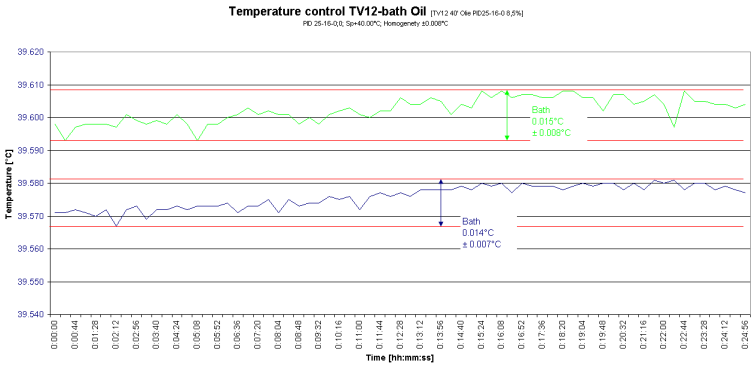
Set the integral time “Ti” and the derivative Time “Td” to off. Check if the Lcb and Hcb are set to auto.

Ignore the fact that the temperature may not settle precisely at the set point. If the temperature is stable, reduce the proportional band Pb so that the temperature just starts to oscillate. If the temperature is already oscillating, increase the proportional band until it begins oscillating. Allow enough time between each adjustment for the loop to stabilize. Make a note of the proportional band value “B” and the period of oscillation “T” Set the Pb, Ti and Td parameter values according to the calculations given in the table below:

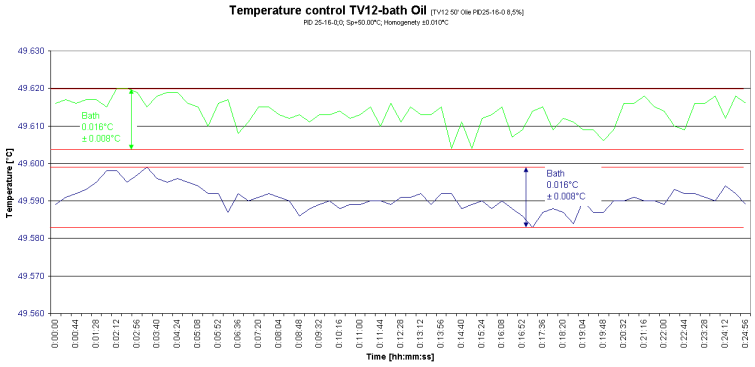
Type of control	Proportional band	Integral time "**ti**"	Derivative Time "**td**"
Proportional only	2xB	Off	Off
P + I control	2,2xB	0,8xT	Off
P + I + D control	1,7xB	0,5xT	0,12xT

7.4 Precision of control

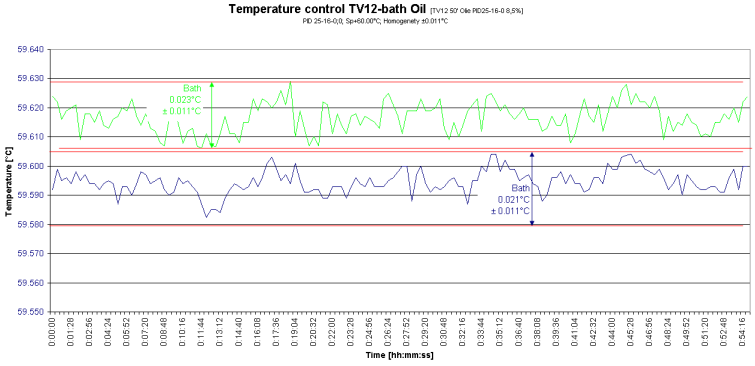
Temperature	:	40°C
Proportional band (Pb)	:	25
Integrator	:	16
Differentiator	:	0
Min/max	:	± 0,008°C



Temperature	:	50°C
Proportional band (Pb)	:	25
Integrator	:	16
Differentiator	:	0
Min/max	:	± 0,008°C

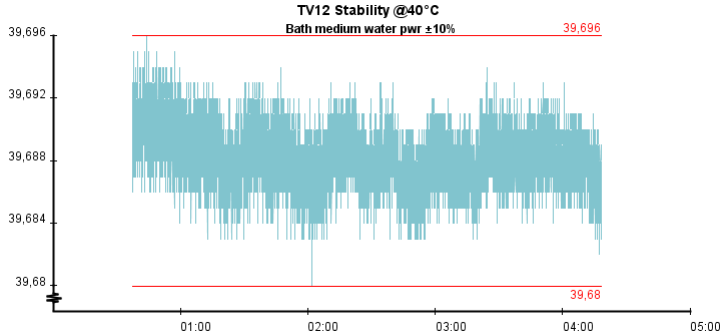


Temperature	:	60°C
Proportional band (Pb)	:	25
Integrator	:	16
Differentiator	:	0
Min/max	:	± 0,011°C



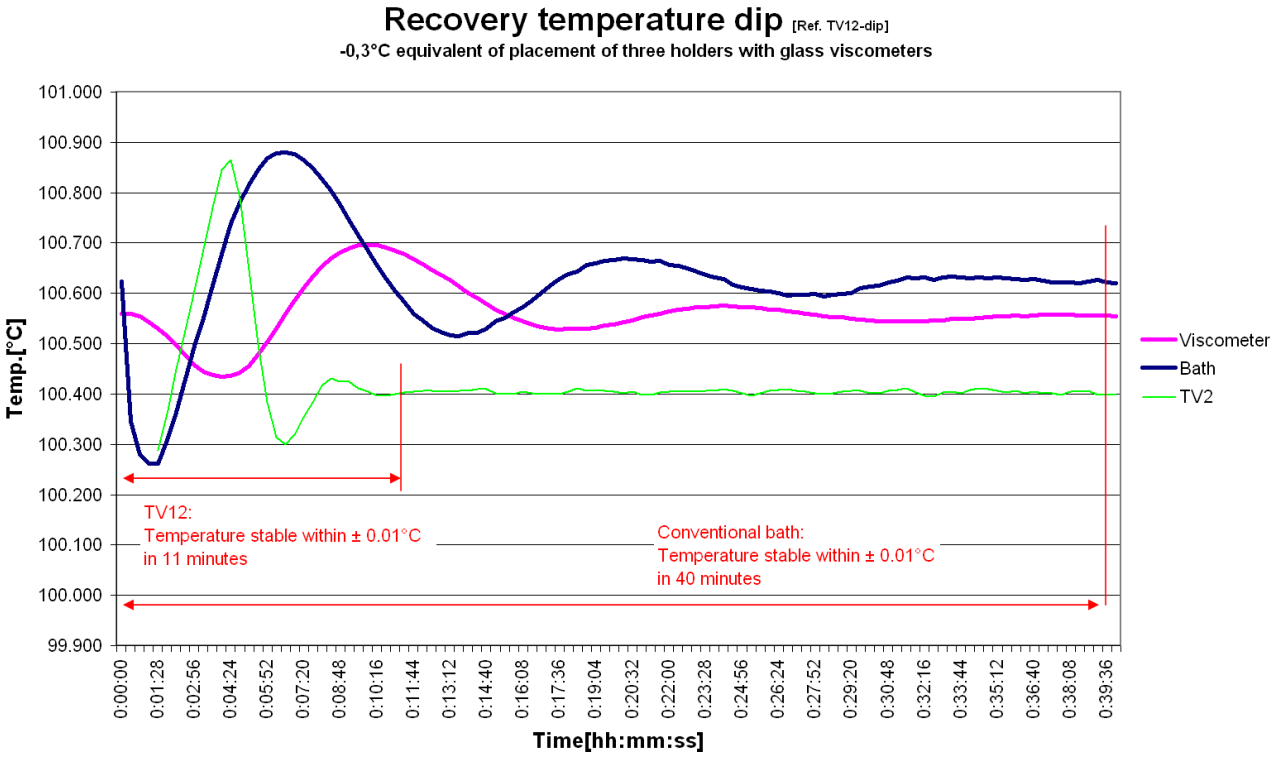
7.5 Long term stability

Temperature	:	40°C
Time period	:	4 hrs
Proportional band (Pb)	:	25
Integrator	:	16
Differentiator	:	0
Min/max	:	± 0,008°C
Standard dev	:	0,002°C



Temperature settling times
When the bath temperature is disturbed i.e. when viscometer holders are placed, the electronic regulation will establish new control over 3 times faster than conventional systems.

The graph shows the temperature of a conventional bath(blue) and the temperature measured in the glass capilary of a viscometer(pink). The green curve shows the TV12 behaviour.



7.6 Homogeneity and ΔT

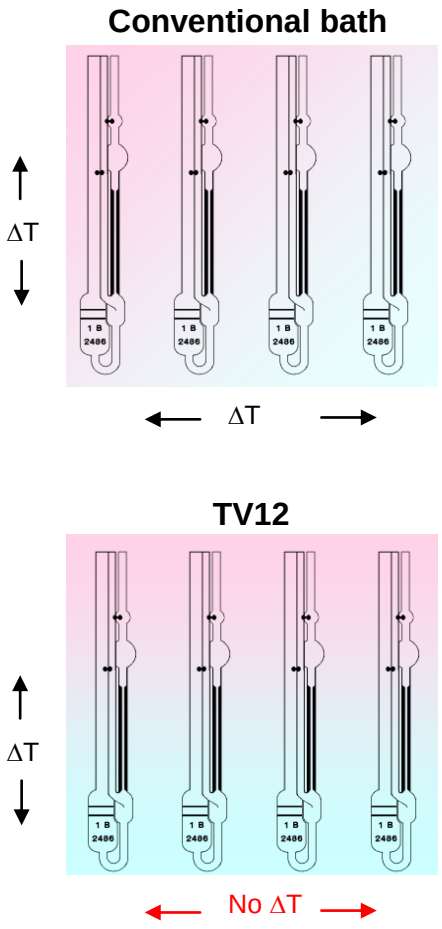
All thermostatic bath contain heating. Simple bath constructions have a single heater system and no baffle plates for controlled circulation. This causes poor energy ditribution thus poor homogeneity. The heating energy is distributed rather randomly.

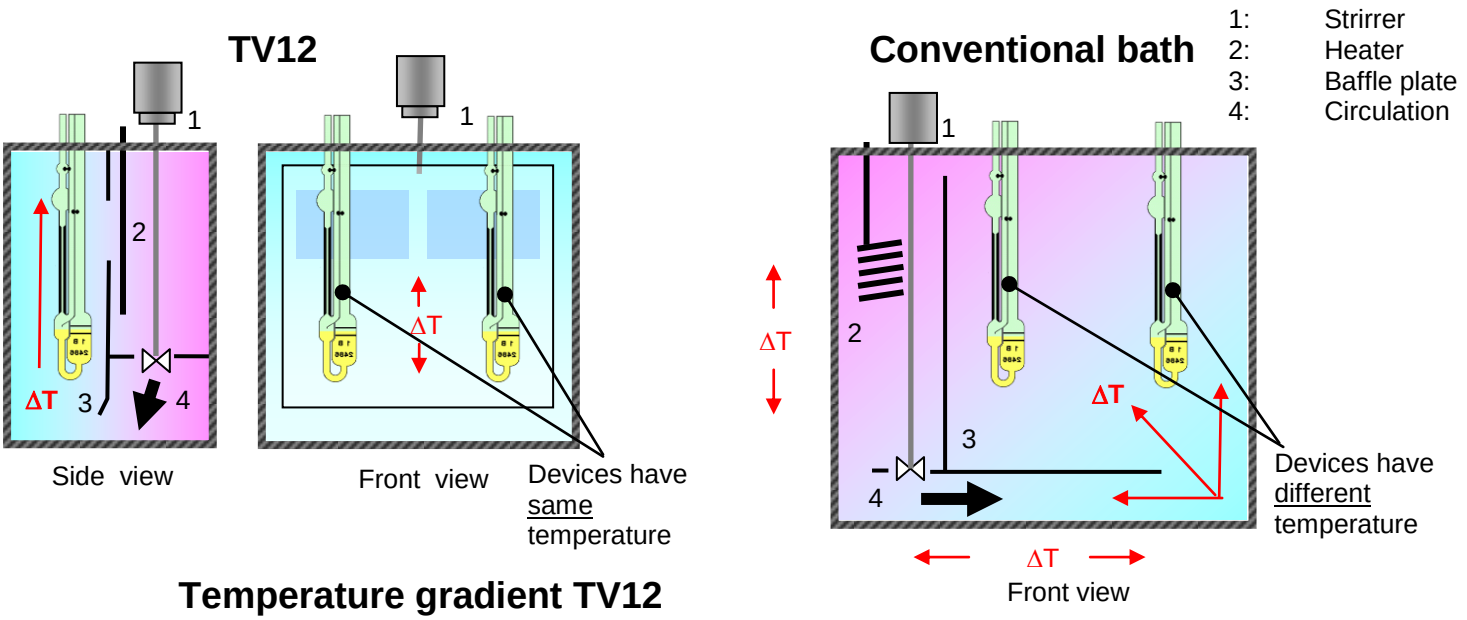
More sophisticated systems have controlled flow by using a baffle plate. This still does not prevent horizontal and vertical temperature fluctuations.

The special heating element in the TV12 prevents horizontal fluctuations. The delta in temperature thus is limited in only the vertical position.

When aligning viscometers or sensors in horizontal position they will all have the same temperature.

The homogeneity in the TV12 lies in the order of the delta T fluctuation (± 0.005°C).





Temperature gradient TV12
versus conventional system

8 RS232 Commands

For RS232 operation see our manual

9 TROUBLE SHOOTING

9.1 Application errors

All Tamson products are well designed and thoroughly tested before shipping. This will not fully prevent small problems in the field. Following will help you to locate commonly known problems and how to fix them. In case of doubt please check your local dealer or Tamson instruments bv.

9.2 Bath malfunction

- The pump motor is not running and electronics are dead.

Check mains and main fuse.
Check over-temperature protection see “Temperature control and setting” page 14.

- Motor is not turning

The motor fuse is activated. *Restart the motor by pressing the motor fuse. This fuse is located at the backside of the top casing*. *Also check viscosity of the bath fluid. High viscosity will activate the motor fuse.*
Electrical defect.
Motor capacitor defective, replace capacitor or contact local dealer or Tamson instruments bv

9.3 Problems with set point

- Heater LED is not burning, motor is turning and temperature rises above set point.

Set point too near to room temperature*. Cooling of the bath is needed.*

- Temperature doesn’t reach set point, motor turns fast.

Bath fluid evaporates too quickly. Use other fluid.
Heater malfunctions. *Measure mains electrical current output. Low power consumption indicates a problem with the heating element.*
Cooling capacity is too high*. Reduce cooling.*

- Temperature not stable

*See explanation “*Bath temperature does not become stable*” page 26.*

9.4 Faulty temperature reading or temperature offset

- The temperature readout on the display does not correspond to the temperature measured.

PT100 is defective,
PT100 has aged. Check offset see page

9.5 Bath temperature does not become stable

If the bath temperature does not stabilize after 30 minutes after set point has been reached the following points might cause this problem:
The operating temperature is around or below 30°C. To stabilize the bath at set-points just above the ambient temperature it is necessary to apply cooling water to the cooling coil or to increase or decrease the flow of cooling water through the cooling coil.

If the operating temperature is far above the ambient temperature it is most likely that the viscosity of the bath fluid used is too high. The maximum viscosity of the bath fluid lies below 20 cSt at the operating temperature but is preferably less than 10 cSt. If the viscosity of the bath fluid used is too high the circulating system is incapable to mix it thoroughly resulting in poor stability.

Check PID constant of the bath.
P) 25
I) 16
D) 0

Position of the stirrer fan must be exactly in the center of the hole in the baffle plate (both in horizontal and vertical position).

Check possible heat transfer from additional apparatus close to the bath i.e. oven or central heating.

Check any possible strong magnetic field from other apparatus.

Check overheating of electronics inside apparatus. Cooling fan at backside must run.

Check if stirrer is turning.

9.6 Bath doesn't reach SP

Check menu item MAX power, raise value.

10 Spare parts list

230 Volt 50~60Hz	115 Volt 60Hz	Description
25T1295	25T1301	Motor for stirrer
25T1343	n.a.	Capacitor 2uF
n.a.	25T1344	Capacitor 7uF
25T0340	25T0345	Heater 780 Watts
24T8081	n.a.	Motor fuse 0.3 Amp.
n.a.	24T8080	Motor fuse 0,6 Amp.
06T0512	06T0522	PCB Mains board with filter and relay
25T0351		Heater "W"
24T8581		Over-temperature protection thermostat
25T0012		Filling valve
24T8545		Mains switch
24T8546		Protective cover mains switch
28T4019		Front keypad
25T2310		PT-100 sensor
06T0500		PCB - Controller
06T0503		PCB - IO

n.a. = Not Applicable

11 Dimensions

Dimensions		
Depth/length	420 [mm]	
Width	330 [mm]	
Height	750 [mm]	
Weight*	30 [kg]	
Bath		
Depth	300mm	
Opening	248x73mm	
Power consumption		
Minimum	200 [W]	
Nominal	600 [W]	
Maximum	1400 [W]	
Accuracy		
Standard deviation	0,004 [°C]	Measured with methanol over 1hr 1 sec interval
Min/Max	0,015 [°C]	Measured with methanol over 1hr 1 sec interval
Temperature drift		
per year	0,001 [°C]	
per [°C] ambient	0,0005 [°C]	
Homogeneity		
Standard deviation	0,004 [°C]	
Min/Max	0,015 [°C]	

12 EC DECLARATION OF CONFORMITY THERMOSTATIC BATH TV-SERIES

Manufacturer: **Tamson Instruments BV**
van 't Hoffstraat 12
2665 JL Bleiswijk
The Netherlands

Product: Thermostatic bath

Model: TV12

We declare that the product mentioned above conforms to the essential's exigency of the directive 2006/42/EC relative to machinery, directives 2004/108/EC relatives to electromagnetic compatibility and directive 2006/95/EC relative to low voltage.

The products are in conformity with the following specifications:
EMC (2004/108/EG)

Conducted emission	- EN55016-2-1 + EN61326+A1
Radiated emission	- EN55016-2-3 + EN61326+A1+A2+A3
Harmonics	- EN61000-3-2
ESD	- EN61326 +A1+A2+A3 and EN61000-4-2 +A1+A2
Radiated immunity	- EN61000-4-3 +A1
Electrical Fast Transients	- EN61000-4-4+A1+A2
Surges	- EN61000-4-5+A1
Conducted immunity	- EN 61000-4-6+A1
Voltage dips and Voltage variations	- EN61000-4-11 +A1

Low voltage (2006/95/EC):
Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1, General requirements,
EN 61010-1-2010
Safety requirements for electrical equipment for measurement, control, and laboratory use Part 2, Particular requirements for laboratory equipment for the heating of material,
EN 61010-2-010-2003
Machinery directive (2006/42/EC)
2006-42-ec-2nd-2010

January 2013, Tamson Instruments bv, The Netherlands

Ing. R.C. van Hall
Director

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